

CLAIMS

1. Method of producing, in gaseous form and under high pressure, at least one fluid chosen from
5 oxygen, argon and nitrogen in an air separation unit, in which all the air intended for distillation is compressed in a compressor (1), the compressed air is purified, at least a first
10 portion of the air is supercharged to a high pressure, the compressed and purified air is sent into a heat exchange line (6) of the installation where it cools, the compressed, purified and cooled air is separated in a system of columns (8,
15 9) of the unit comprising at least one distillation column, a fluid (16) is withdrawn in the liquid state from one column of the system of columns, the said fluid in the liquid state is brought to the high pressure, it is vaporized by heat exchange with the air and the vaporized
20 liquid at this high pressure is warmed in the heat exchange line of the installation, at least one portion of the supercharged air is expanded in an expansion turbine (4, 4B) from the high pressure to a second pressure, the expanded air (22) then
25 being sent into one column of the system of columns, in normal operation the supercharged air being cooled down to the inlet temperature of the turbine in the exchange line upstream of the expansion turbine,
30 characterized in that, during start-up of the air separation unit and/or in order to regulate the inlet temperature of the turbine and/or during a change of operation, at least one portion of the air supercharged to the high pressure is sent
35 upstream of the expansion turbine without passing through the exchange line.

2. Method according to Claim 1 in which:
- at least one portion of the air in the process of cooling in the heat exchange line (6) is extracted from the latter at an intermediate temperature of the exchange line;
 - the air is supercharged at the intermediate temperature in a cold blower (5A) to the high pressure;
 - the supercharged air is reintroduced into the heat exchange line;
 - a first portion (43) of the supercharged air is sent into one column (8, 9) of the system of columns and a second portion (41) of the supercharged air is sent into the expansion turbine (4), the expanded air then being sent into one column of the system of columns;
 - during start-up of the installation and/or during a change of operation and/or when the temperature at the turbine inlet falls below a predetermined threshold, at least one portion of the air extracted from the exchange line and supercharged in the cold blower is sent upstream of the expansion turbine without passing through the exchange line.
3. Method according to Claim 2, characterized in that all the incoming air in the process of cooling is extracted, supercharged in the cold blower (5A) and reintroduced into the exchange line (6).
4. Method according to Claim 2 or 3, characterized in that during start-up of the installation, all the air extracted from the exchange line (6) and supercharged in the cold blower (5A) is sent upstream of the expansion turbine (4) without passing through the exchange line.
5. Method according to Claim 2, 3 or 4, in which, when the temperature of the air supercharged in

the cold blower (5A) is reduced to a predetermined temperature or after a predetermined time, no more supercharged air is sent upstream of the expansion turbine (4) without passing through the exchange line.

6. Method according to one of Claims 2 to 5 in which the inlet temperature of the cold blower (5A) is lower than the inlet temperature of the expansion turbine (4).

7. Method according to Claim 1 in which at least one portion of the air is compressed to the high pressure, the air at the high pressure is sent into the hot end of the exchange line (6), a portion of the air is extracted from the exchange line at an intermediate temperature and expanded in the turbine (4) and the rest of the air continues its cooling in the exchange line (6) and in which, during start-up of the installation and/or if the inlet temperature of the turbine falls below a predetermined threshold, at least one portion of the supercharged air is sent directly to a supercharger (5) which is used to supercharge at least one portion of the air to the high pressure as far as the inlet of the turbine (4) without having been cooled in the exchange line.

8. Method according to Claim 7 in which all the air is compressed in the compressor (1) and the supercharger (5) to the high pressure or only a portion of the air is supercharged in a supercharger (5) to the high pressure.

9. Method of producing, in gaseous form and under high pressure, at least one fluid chosen from oxygen, argon and nitrogen, in which method, in stable operation, the air is compressed in a

compressor (1), the compressed air is purified and sent into a heat exchange line (6) of the installation in which it is cooled, the compressed, purified and cooled air is separated in a system of columns (8, 9) of the installation comprising at least one distillation column, a fluid (16) is withdrawn in the liquid state from one column of the system of columns, the said fluid in the liquid state is brought to the high pressure, vaporized by heat exchange with air and the vaporized liquid is warmed at this high pressure in the heat exchange line (6) of the installation:

- a flow of compressed nitrogen in the process of cooling in the heat exchange line is extracted from the latter at an intermediate temperature of the exchange line;
 - the nitrogen is supercharged at the intermediate temperature in a cold blower (5B) up to the first pressure;
 - the supercharged nitrogen is reintroduced into the heat exchange line;
 - some or all of the supercharged nitrogen is sent into an expansion turbine (4B), the expanded nitrogen then being sent into one column of the system of columns,
- characterized in that, during start-up of the installation and/or when the inlet temperature of the turbine inlet falls below a predetermined threshold and/or during a change of operation, at least one portion of the nitrogen extracted from the exchange line and supercharged in the cold blower (5B) is sent upstream of the expansion turbine (4B) without passing through the exchange line.

10. Installation for producing, in gaseous form and under high pressure, at least one fluid chosen from oxygen, argon and nitrogen, of the type

comprising a system of air distillation columns (8, 9), a supercharger (5, 5A, 5B) to supercharge at least one portion of the supply air or of cycle gas up to a high pressure, a heat exchange line (6) bringing the incoming air and the fluids withdrawn from the system of columns, including the said fluid(s) in liquid form withdrawn from the distillation unit and compressed by a pump, into heat exchange relationship and a turbine (4, 4B) the inlet of which is linked to the outlet of the supercharger by means that pass through the heat exchange line and is characterized in that the turbine inlet is also linked to the outlet of the supercharger (5, 5A, 5B) by means (45) that do not pass through the heat exchange line.

11. Installation according to Claim 10, comprising a cold blower (5A, 5B), means for supplying this cold blower with air or a cycle gas in the process of cooling taken at an intermediate temperature level from the heat exchange line (6), means for reintroducing the supercharged air or the supercharged cycle gas into passages of the heat exchange line that are linked to the turbine (4, 4B), the turbine inlet also being linked to the outlet of the cold blower by means (45) that do not pass through the heat exchange line.

12. Installation according to Claim 11, characterized in that it comprises means (37) for sending all the air intended to be distilled to the cold blower.

13. Installation according to Claim 11 or 12, characterized in that it comprises means for detecting the temperature of the air or of the cycle gas leaving the cold blower upstream of the heat exchange line.

14. Installation according to Claim 11, 12 or 13 comprising means (V1, V2) for opening and closing the lines linking the inlet of the turbine (4, 4B) with the outlet of the cold blower (5A, 5B) while
5 passing through the passages of the exchange line and without passing through the passages of the exchange line.
15. Installation according to one of Claims 11 to 14,
10 characterized in that the turbine inlet being linked to the outlet of the cold blower by means (45) that do not pass through the heat exchange line and that do not comprise cooling means.
- 15 16. Installation according to Claim 10 comprising means (1, 5) for compressing all or some of the air intended for distillation at the high pressure upstream of the exchange line (6) and means for
20 sending the air at the high pressure from the supercharger (5) as far as the hot end of the exchange line.
17. Installation according to Claim 16 in which the turbine inlet and the supercharger outlet are
25 linked via cooling means (47).